

CLAIMS

I claim:

1. A fluid flow system for use in heating, cooling and dehumidifying an air flow stream in an air conditioning system comprising:

a reheat coil downstream of a precool coil and having a cooling coil positioned therebetween in the air flow stream;

a hot water control valve in fluid communication with the precool coil, a hot fluid source and the reheat coil;

a bypass valve in fluid communication with the reheat coil, the precool coil and a bypass conduit;

a pump intermediate the hot water control valve and the reheat coil to pump a fluid in a fluid flow through the fluid flow system; and

a check valve in fluid communication with the fluid flow system intermediate the precool coil and the hot water control valve.

2. The fluid flow system as in claim 1 wherein the fluid flow comprising:

the pump pumping the fluid from the hot water control valve through the reheat coil to the bypass valve.

the fluid circulating through the precool coil when the bypass valve is in a first position and the fluid passing through the bypass conduit when the bypass valve is in a second position; and

the fluid returning to the hot water control valve for recirculation therethrough; and

the check valve releasing excess fluid pressure in the fluid flow system.

3. The fluid flow system as in claim 2 wherein the hot water control

valve is positioned for passing therethrough of a hot fluid received from the hot fluid source to be circulated by the pump; and the hot fluid may exit the fluid flow system through the check valve.

4. The fluid flow system as in claim 1 wherein there is a purge valve in fluid communication with the fluid flow system intermediate the precool coil and the check valve.

5. The fluid flow system as in claim 1 wherein the hot fluid source is a hot water source.

6. The fluid flow system as in claim 1 wherein the check valve is structured to control the formation of gas bubbles in the hot fluid.

7. The fluid flow system as in claim 1 wherein the check valve is constructed of a nonferrous material and has an internal bleed port integral therein.

8. The fluid flow system as in claim 1 wherein the check valve is constructed of a nonferrous material and has an external bleed tube.

9. The fluid flow system as in claim 7 wherein the internal bleed port is sized as determined by a percentage of a total fluid flow in the fluid flow system when in a recuperative system mode.

10. The fluid flow system as in claim 1 wherein a control panel having the functions of controlling the fluid flow system for cooling, humidification, dehumidification, heating, freeze protecting, and defrost comprising:

determining the position of the bypass valve and the hot water control valve; and

setting the sequence of turn on and turn off of the pump and fan as well as a compressor in fluid communication with the cooling coil.

11. A fluid flow system as in claim 1 wherein the pump is positioned intermediate the reheat coil and the bypass valve.

12. The flow system as in claim 1 wherein there is a condensate baffle pan mounted under the precool coil.

13. The fluid flow system as in claim 1 wherein the reheat coil and the cooling coil are formed of a unitized tube sheet having a fin gap therebetween.

14. The fluid flow system as in claim 13 wherein the fin gap is greater than $1/4$ to $1/2$ inches.

15. The fluid flow system as in claim 13 wherein the precool coil is formed as part of the unitized tube sheet.

16. A fluid flow system for use in heating, cooling and dehumidifying an air flow stream in an air conditioning system comprising:

a reheat coil downstream of a precool coil and having a cooling coil positioned therebetween in the air flow stream;

a hot water control valve in fluid communication with the precool coil, a hot fluid source and the reheat coil;

a bypass valve in fluid communication with the reheat coil, the precool coil and a bypass conduit;

a check valve in fluid communication with the fluid flow system intermediate the precool coil and the hot water control valve;

a pump intermediate the hot water control valve and the reheat

coil to pump a fluid in a fluid flow through the fluid flow system;

wherein the fluid flow comprising:

the pump pumping the fluid from the hot water control valve through the reheat coil to the bypass valve.

the fluid circulating through the precool coil when the bypass valve is in a first position and the fluid passing through the bypass conduit when the bypass valve is in a second position; and

the fluid returning to the hot water control valve for recirculation therethrough; and

the check valve releasing excess fluid pressure in the fluid flow system.

17. The fluid flow system as in claim 16 wherein the hot water control valve is positioned for passing therethrough of a hot fluid received from the hot fluid source to be circulated by the pump; and the hot fluid may exit the fluid flow system through the check valve.

18. The fluid flow system as in claim 16 wherein there is a purge valve in fluid communication with the fluid flow system intermediate the precool coil and the check valve.

19. The fluid flow system as in claim 16 wherein the check valve is structured to control the formation of gas bubbles in the hot fluid.

20. The fluid flow system as in claim 16 wherein an internal bleed port is sized as determined by a percentage of a total fluid flow in the fluid flow system when in a recuperative system mode.

21. The fluid flow system as in claim 16 wherein a control panel having the functions of controlling the fluid flow system for cooling;

humidification, dehumidification, heating, freeze protecting, and defrost comprising:

- determining the position of the bypass valve and the hot water control valve; and

- setting the sequence of turn on and turn off of the recirculating pump and fan as well as a compressor in fluid communication with the cooling coil.

22. A fluid flow system for use in heating, cooling and dehumidifying an air flow stream in an air conditioning system comprising:

- a reheat coil downstream of a precool coil and having a cooling coil positioned therebetween in the air flow stream;

- a hot water control valve in fluid communication with the precool coil, a hot fluid source and the reheat coil;

- a bypass valve in fluid communication with the reheat coil, the precool coil and a bypass conduit;

- a check valve in fluid communication with the fluid flow system intermediate the precool coil and the hot water control valve and the check valve is structured to control the formation of gas bubbles in the hot fluid;

- the hot water control valve is positioned for passing therethrough of a hot fluid received from the hot fluid source to be circulated by a pump and the hot fluid may exit the fluid flow system through the check valve;

- a purge valve in fluid communication with the fluid flow system intermediate the precool coil and the check valve;

- an internal bleed port in the check valve is sized as determined by a percentage of a total fluid flow in the fluid flow system when in a recuperative system mode;

- the pump intermediate the hot water control valve and the reheat coil to pump a fluid in a fluid flow through the fluid flow system;

- wherein the fluid flow comprising:

the pump pumping the fluid from the hot water control valve through the reheat coil to the bypass valve;

the fluid circulating through the precool coil when the bypass valve is in a first position and the fluid passing through the bypass conduit when the bypass valve is in a second position;

the fluid returning to the hot water control valve for recirculation therethrough;

the check valve releasing excess fluid pressure in the fluid flow system;

a control panel having the functions of controlling the fluid flow system for cooling, humidification, dehumidification, heating, freeze protecting, and defrost comprising:

determining the position of the bypass valve and the hot water control valve; and

setting the sequence of turn on and turn off of the recirculating pump and fan as well as a compressor in fluid communication with the cooling coil.

23. The fluid flow system as in claim 1 wherein the check valve has a valve disk having a calibrated groove formed therein.

24. The fluid flow system as in claim 1 wherein there is a combination valve in fluid communication with the fluid flow system intermediate the precool coil and the check valve.

25. The fluid flow system as in claim 24 wherein the combination valve comprising; a separator body having a coalescing fill material therein; and alternate purge valve; a balancing valve; and a float valve in fluid communication with the separator body.

26. The fluid flow system as in claim 25 wherein the separator body is positioned at a 45 degree angle relative to a fluid flow.